

Table 1a. Summary of test conditions for hydrogen generation in the autothermal microreactor for uni-directional (UD-AT) and reverse-flow (RF-AT) modes of operation.

Experiment	Operation	CH ₄ , ml/min	O ₂ , ml/min	GHSV, h ⁻¹	CH ₄ :O ₂	T _{ign} , °C	T _{final} , °C
1	UD-AT	32.9	33.0	43429.42	1.0	907	28.6
2	UD-AT	30.9	31.2	40935.84	1.0	907	28.6
3	UD-AT	28.8	31.2	39543.74	0.9	907	28.6
4	UD-AT	24.7	31.2	36833.69	0.8	907	28.6
5	UD-AT	20.6	31.2	34123.63	0.7	907	28.6
6	UD-AT	32.9	26.8	39314.75	1.2	900	32
7	UD-AT	32.9	31.2	42253.8	1.1	900	32
8	UD-AT	32.9	33.9	44017.23	1.0	900	32
9	UD-AT	32.9	35.7	45192.85	0.9	900	32
10	UD-AT	32.9	40.1	48131.9	0.8	900	32
11	UD-AT	32.9	46.4	52246.57	0.7	904	34
12	RF-AT	32.9	46.4	52246.57	0.7	722	34
13	UD-AT	39.5	46.4	56582.66	0.9	908	58
14	RF-AT	39.5	46.4	56582.66	0.9	678	58

Table 1b. Summary of experimental results for hydrogen generation in the autothermal microreactor for uni-directional (UD-AT) and reverse-flow (RF-AT) modes of operation.

Experiment	Operation	MF H ₂	MF CH ₄	MF O ₂	MF CO ₂	MF CO	MF H ₂ O	Conv %	Select %	Yield %
1	UD-AT	1.65E-01	4.05E-01	3.06E-02	2.89E-01	9.92E-03	9.92E-02	42.49	62.50	26.56
2	UD-AT	1.61E-01	3.87E-01	3.63E-02	3.23E-01	8.87E-03	8.06E-02	46.13	66.67	30.75
3	UD-AT	1.64E-01	3.52E-01	4.18E-02	3.52E-01	9.02E-03	8.20E-02	50.63	66.67	33.75
4	UD-AT	1.57E-01	3.10E-01	4.96E-02	3.93E-01	8.26E-03	7.85E-02	56.40	66.67	37.60
5	UD-AT	1.43E-01	2.95E-01	8.38E-02	4.10E-01	7.14E-03	6.57E-02	58.53	68.49	40.09
6	UD-AT	2.23E-01	3.79E-01	4.69E-02	2.46E-01	8.93E-03	9.60E-02	40.14	69.93	28.07
7	UD-AT	2.45E-01	3.51E-01	4.31E-02	2.56E-01	8.52E-03	9.64E-02	42.91	71.76	30.79
8	UD-AT	2.60E-01	3.32E-01	4.15E-02	2.65E-01	8.31E-03	9.35E-02	45.11	73.53	33.17
9	UD-AT	2.79E-01	2.94E-01	4.13E-02	2.84E-01	8.26E-03	9.30E-02	49.82	75.00	37.37
10	UD-AT	3.03E-01	2.40E-01	4.23E-02	3.27E-01	8.65E-03	8.17E-02	58.26	78.75	45.88
11	UD-AT	2.91E-01	2.62E-01	3.33E-02	2.77E-01	9.93E-03	1.28E-01	52.20	69.49	36.27
12	RF-AT	3.09E-01	2.68E-01	2.75E-02	2.75E-01	1.01E-02	1.07E-01	51.52	74.24	38.24
13	UD-AT	4.29E-01	1.93E-01	1.55E-02	2.52E-01	6.72E-03	1.01E-01	57.25	80.95	46.34
14	RF-AT	4.56E-01	1.85E-01	1.49E-02	2.42E-01	6.45E-03	9.68E-02	57.25	82.48	47.22